

# Two New Aeolid Nudibranchs from Southern California

by

DAVID W. BEHRENS

Pacific Gas and Electric Company, Biological Research Laboratory,  
P.O. Box 117, Avila Beach, California 93424, U.S.A.

*Abstract.* Two species, *Cuthona hamanni* sp. nov. and *Eubranthus steinbecki* sp. nov., from southern California are described.

## INTRODUCTION

Southern California has historically been a very active area for opisthobranch research. The vicinity of San Diego, California, has produced numerous new species, as recently as 1986: GOSLINER (1981) described *Cuthona phoenix* and BERTSCH & OSUNA (1986) added *Tritonia myrakeenae*. This paper describes the morphology of two new aeolidacean nudibranchs belonging to the genera *Cuthona* Alder & Hancock, 1855, and *Eubranthus* Forbes, 1938.

TERGIPEDIDAE Thiele, 1931

*Cuthona* Alder & Hancock, 1855

*Cuthona hamanni* Behrens, sp. nov.

(Figures 1-5)

La Jolla aeolid (*Cuthona* sp.): BEHRENS, 1980:105, fig. 158.

**Materials examined:** (1) Holotype: one specimen approximately 9 mm long (preserved), collected intertidally



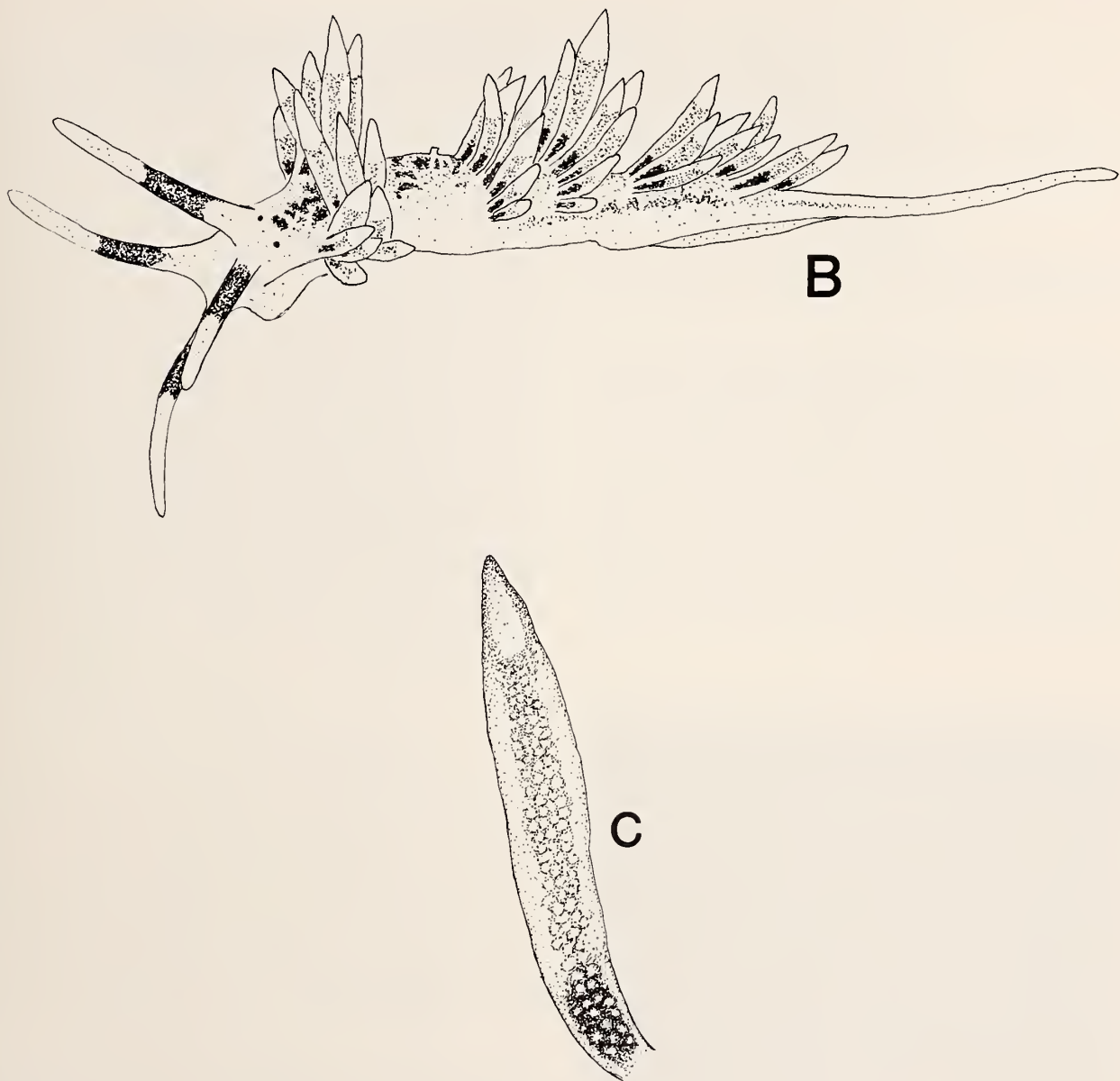


Figure 1

*Cuthona hamanni* Behrens, sp. nov. A. Living animal, 9-mm specimen collected from La Jolla, California. Photograph by Jeff Hamann. B. Living animal drawn from a color transparency. C. Detail of a ceras.

at La Jolla, California (32°51'N, 117°15'W) in July 1983 by Mr. Jeff Hamann. This specimen is deposited in the collection of the California Academy of Sciences, Department of Invertebrate Zoology and Geology (CAS), CASIZ 061410.

(2) Paratypes: two specimens, each 7 mm long (preserved) and collected concurrently with the holotype, are also deposited in the CAS collection, CASIZ 061411.

(3) One specimen, 5 mm long (preserved), collected intertidally at La Jolla, California, in May 1982 by Jeff

Hamann. This specimen is also deposited in the CAS collection, CASIZ 061412. Color transparencies of living *Cuthona hamanni* are on file at CAS.

**Description:** Living animals may reach 14 mm long. The body is typically aeolidiform, elongate and graceful, tapering posteriorly (Figure 1). The foot is narrow, linear, tapering to a point posteriorly. The tail is long. The foot corners are square and somewhat laterally produced. The cephalic tentacles are cylindrical, tapering to a blunt point,

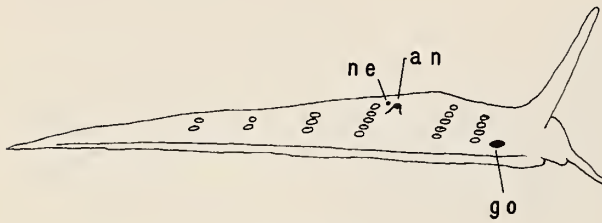


Figure 2

*Cuthona hamanni*. Lateral view. an, anus; go, genital orifice; ne, nephroproct.

and when extended to their fullest are equal in length to the rhinophores. The rhinophores are closely set, long, smooth, and tapering to a rounded tip. The cerata are slightly clavate and attain a length equal to that of the rhinophores (Figure 1C). In one specimen the ceratal half formula was I 4, II 5 (pre-pericardial), III 5, IV 3, V 2, VI 2 (post-pericardial). The ceratal arrangement is shown in Figure 2. The anal pore is located immediately anterior to the uppermost ceras of the first post-pericardial row, to the right of the pericardial elevation (Figure 2). The nephroproct is just medial to the anal pore (Figure 2). The

genital orifice is located just below the pre-pericardial cerata on the right side of the body (Figure 2).

The ground color of the body is transparent white. The internal organs are easily seen through the body wall. Irregular patches of white and dark-brown pigment occur dorsally from the rhinophores to the tip of the tail. The white patches are more laterally distributed than the brown pigmentation. Some white spots occur on the head. The distal  $\frac{1}{3}$  of the rhinophores and cephalic tentacles is encrusted with white pigment, followed by a band of dark brown more proximally. The remaining  $\frac{1}{3}$  is similar to the ground color of the body. White speckling may overlay the proximal  $\frac{2}{3}$  of these appendages. The coloration of the cerata is complex (Figure 1B). The tip of each ceras is white, followed by a granular appearing medial region. The granular appearance of this region, which makes up  $\frac{3}{4}$  the length of each ceras, is created by a series of uniformly spaced white specks overlaying the semi-translucent liver diverticulum. The color of the liver varies from tan to orange and salmon. Basally, the coloration of the liver abruptly changes to kelly green, forming a characteristically dark band. Occasional brown specks were observed on the cerata of several specimens.

The radular formula is 13–20  $\times$  0.1.0. There are no

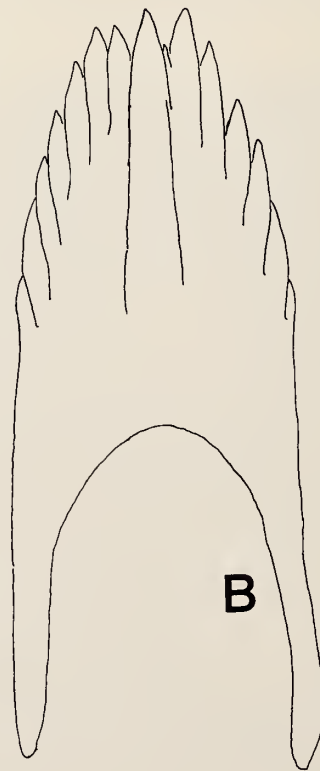


Figure 3

*Cuthona hamanni*. A. Scanning electron micrograph of radula. B. Drawing of a rachidian tooth.



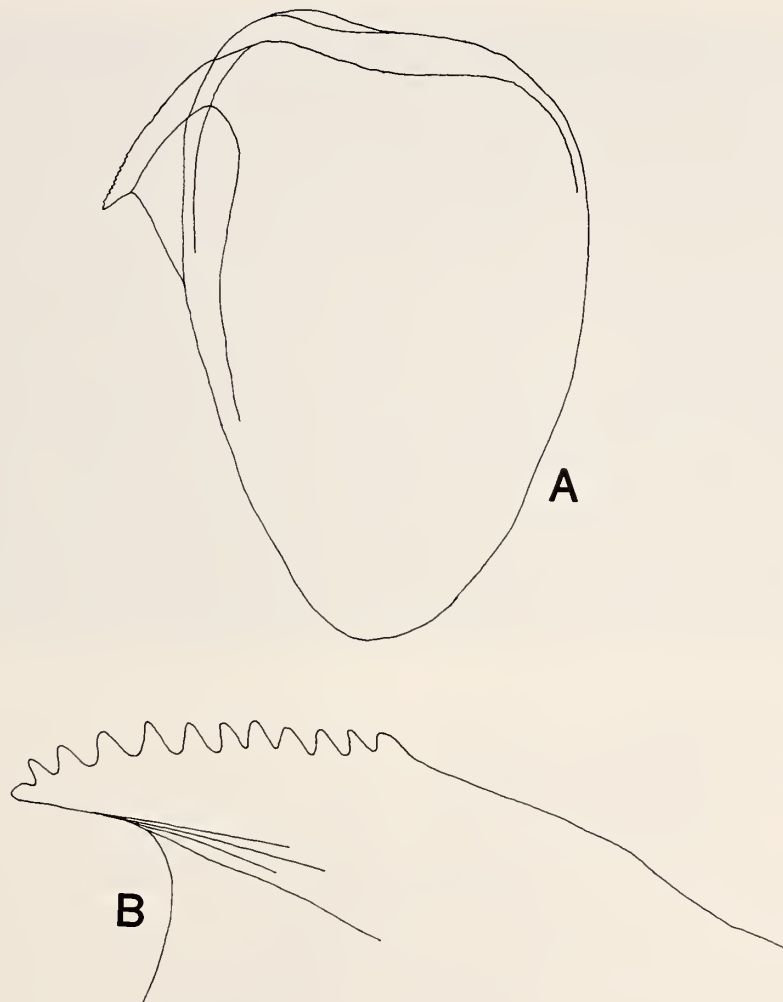


Figure 4

*Cuthona hamanni*. A. Jaw. B. Masticatory border of the jaw.

preradular teeth. Each rachidian tooth is a tall horseshoe-shaped arch, with a long articular socket on the anterior surface on either side (Figures 3A, B). The central cusp is barely differentiated from the denticles, but does form a low ridge. There are 6 or 7 strong, equal-size denticles to each side of the cusp. The jaws are lightly tinted gold and broadly oval (Figure 4A). The masticatory border is short and angular with 10 irregular denticles (Figure 4B).

The reproductive system is typically cuthonid (Figure 5). The penial papilla is conical, bearing a stylet, and is associated with a large bulbous penial gland. The vas deferens is prostatic. The receptaculum seminis comprises a single lobe and inserts into a common junction at the orifice of the large lobate female gland mass through a short duct. The ampulla is bulbous and connects with the receptaculum seminis through a long duct.

**Discussion:** Placement of *Cuthona hamanni* is based upon the presence of a non-tapering radula and the absence of a preradular tooth (GOSLINER & GRIFFITHS, 1981). The presence of a penial stylet is variable within the genus (MILLER, 1977).

*Cuthona hamanni* can be separated from northeastern Pacific species by its distinctive body and ceratal coloration and by the number of teeth in the radula. Pigmentation on the body region in the form of opaque white patches or spots occurs in *C. abronia* (MacFarland, 1966), *C. albocrusta* (MacFarland, 1966), and *C. perca* (Marcus, 1958) (MCDONALD, 1983; BEHRENS, 1984). None of these species bears white and brown patches of pigmentation simultaneously, however. The uniform spotting and the bold green coloration of the liver diverticulum at the insertion of the cerata differ strikingly from the ceratal coloration of all

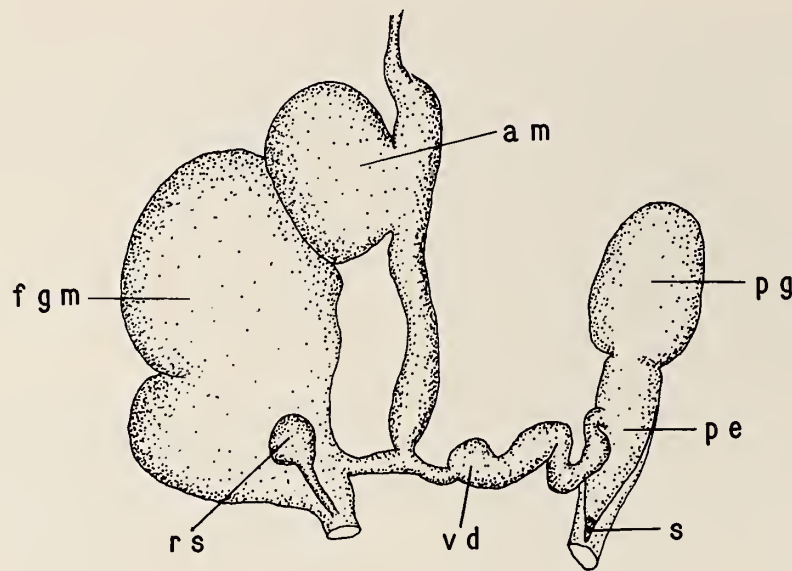


Figure 5

*Cuthona hamanni*. Reproductive system. am, ampulla; fgm, female gland mass; pe, penis; pg, penial gland; rs, receptaculum seminis; s, stylet; vd, vas deferens.

described species. The number of radular teeth in *C. hamanni* (13–20) is very low, approached only by *C. fulgens* (MacFarland, 1966), which has from 16 to 59 teeth, and *C. perca*, bearing 16 to 35 radular teeth.

The specific name *hamanni* is chosen to acknowledge the energetic and enthusiastic efforts of Mr. Jeff Hamann to increase our knowledge of opisthobranch mollusks, not only from southern California but throughout the world. Jeff's collections of opisthobranch species, described and undescribed, have assisted researchers in bringing many fascinating discoveries to the attention of the scientific community as a whole. For myself and others, we thank him.

#### EUBRANCHIDAE Odhner, 1934

##### *Eubranchnus* Forbes, 1938

##### *Eubranchnus steinbecki* Behrens, sp. nov.

(Figures 6–9)

*Eubranchnus* sp.: BEHRENS, 1980:105, fig. 157.

**Material examined:** (1) Holotype: one specimen approximately 4 mm long (preserved) collected off boat floats at Dana Landing, Mission Bay, San Diego, California (32°42'N, 117°11'W) 18 August 1978 by Dr. T. M. Gosliner. This specimen is deposited in the collection of the California Academy of Sciences, Department of Invertebrate Zoology and Geology (CAS), CASIZ 061413.

(2) Paratype: one specimen approximately 4 mm (preserved), collected intertidally at Palos Verdes, Los Angeles County, California (34°00'N, 118°47'W) on 23 March 1985 by William Jaeckle. This specimen is also deposited

in the CAS collection, CASIZ 061414. Color transparencies of a living *Eubranchnus steinbecki* are on file at CAS.

**Description:** Living animals reach 6 mm long. The body is typically aeolidiform (Figure 6). The foot is slightly wider than the body, linear and tapering posteriorly into a long tail. The foot corners are square. The cephalic tentacles are cylindrical and short, about ½ the length of the rhinophores (Figures 6, 7). The rhinophores are long, smooth, and taper to a blunt tip. The cerata are cylindrical and irregularly nodular (Figure 6B). The liver diverticulum is nodular within each ceras. The cerata are arranged in 6 or 7 oblique rows dorsolaterally on either side of the dorsum. An example of the branchial half formula is I 2–4, II 2–4 (pre-pericardial), III 3–5, IV 3–4, V 2, VI 2 (post-pericardial). The largest cerata are dorsomedial, with smaller ones situated marginally. The anal pore is anterior to the medial ceras of the third row and ventral to the pericardial elevation (Figure 7). The genital orifice lies posteriorly to the first ceratal row on the right side (Figure 7).

The ground color of the body is tan with dark olive-green mottling. The dark green pigmentation is concentrated dorsomedially, forming a series of longitudinal stripes along the dorsum connecting the ceratal groups. This striping varies greatly, both in darkness and in width, depending on the specimen. The head and proximal regions of the rhinophores and cephalic tentacles are speckled with olive-green. There are wide lateral translucent areas around the eyes. The rhinophores are tipped with white, followed by a dark olive-green band. In some specimens a clear band exists about ⅓ the length from the distal end, followed



Figure 6

*Eubranchus steinbecki* Behrens, sp. nov. A. Living animal. 4-mm specimen collected from Dana Landing. Photograph by T. M. Gosliner. B. Living animal drawn from a color transparency.

by the speckled olive-green head color. The cephalic tentacles are white tipped and may have a green-brown sub-apical band. The cream-colored liver diverticulum is clearly discernible in the cerata. The cnidosac is cream to white. The cerata are covered with various amounts of dark green specks that may disperse, forming rings around the nodulations.

The buccal mass is muscular and the salivary glands large. The radular formula is  $73 \times 1.1.1$ . The central cusp of the rachidian tooth is set lower than the tips of the adjacent denticles and forms a low, central ridge (Figure

8A). There are 4 strong denticles on each side of the central cusp. The lateral teeth are thin rectangular plates with a single cusp on the inner side (Figure 8B), and are typical of the genus *Eubranchus*. The basal leg of the lateral tooth is long, and only slightly tapering, measuring 3 to 4 times the height of the tooth. The jaws are narrow, tapering posteriorly (Figure 8C). The masticatory border bears 19 or 20 denticles (Figure 8D).

The reproductive system is typically eubranchid (Figure 9). The hermaphroditic duct opens into the ampulla terminally. There is a penial gland, and the penis bears an



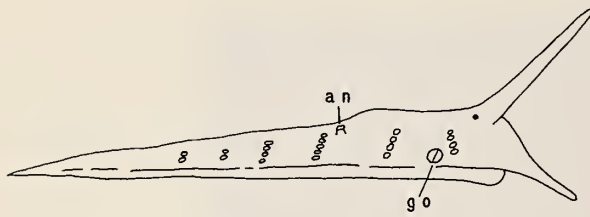


Figure 7

*Eubranchus steinbecki*. Lateral view. an, anus; go, genital orifice.

apparently cuticular stylet. The vas deferens is not prostatic. The ovotestes bear about 12 acini. The region midway between the small receptaculum seminis and the opening of the vagina may function as a bursa copulatrix as described in *Eubranchus farrani* (Alder & Hancock, 1844) by EDMUNDS & KRESS (1969:891, 897). The egg mass is a white-colored coil of  $\frac{3}{4}$ – $\frac{7}{8}$  of a whorl attached to the substrate at the center of the whorl. This mass is longer than that described by HURST (1967) for *E. olivaceus* (O'Donoghue, 1922), but is similar in morphology to the egg mass described for *E. cucullus* Behrens, 1985. Egg masses collected 10 August 1976 at Dana Landing were

approximately 1 mm in diameter and were on the hydroid *Plumularia laganiforma*.

**Discussion:** The characteristics delineating the genus *Eubranchus* are well defined (EDMUNDS & KRESS, 1969). BEHRENS (1985) summarized recent additions to this genus. Of the 28 species known world-wide, many bear green pigmentation. *Eubranchus doriae* (Trinchese, 1874) from the Mediterranean and Atlantic coasts of France is the only other species to concentrate the dorsal pigmentation to form two dark stripes connecting the ceratal groups. Among the five west American species, the radular count of 73 places *E. steinbecki* midway between *E. cucullus* (82) and *E. rustyus* (Marcus, 1961) (50–60), with the remaining species having fewer teeth (ROLLER, 1972; McDONALD, 1983). In this species also the central cusp of the rachidian is shorter than the lateral cusps. Additionally, the number of denticles (19 or 20) on the masticatory border of the jaw of *E. steinbecki* falls between those of the above-mentioned species, with *E. cucullus* having 25 and *E. rustyus* having 12–20 (ROLLER, 1972; McDONALD, 1983).

The specific name *steinbecki* is chosen to give recognition to the author and philosopher John Steinbeck (1902–

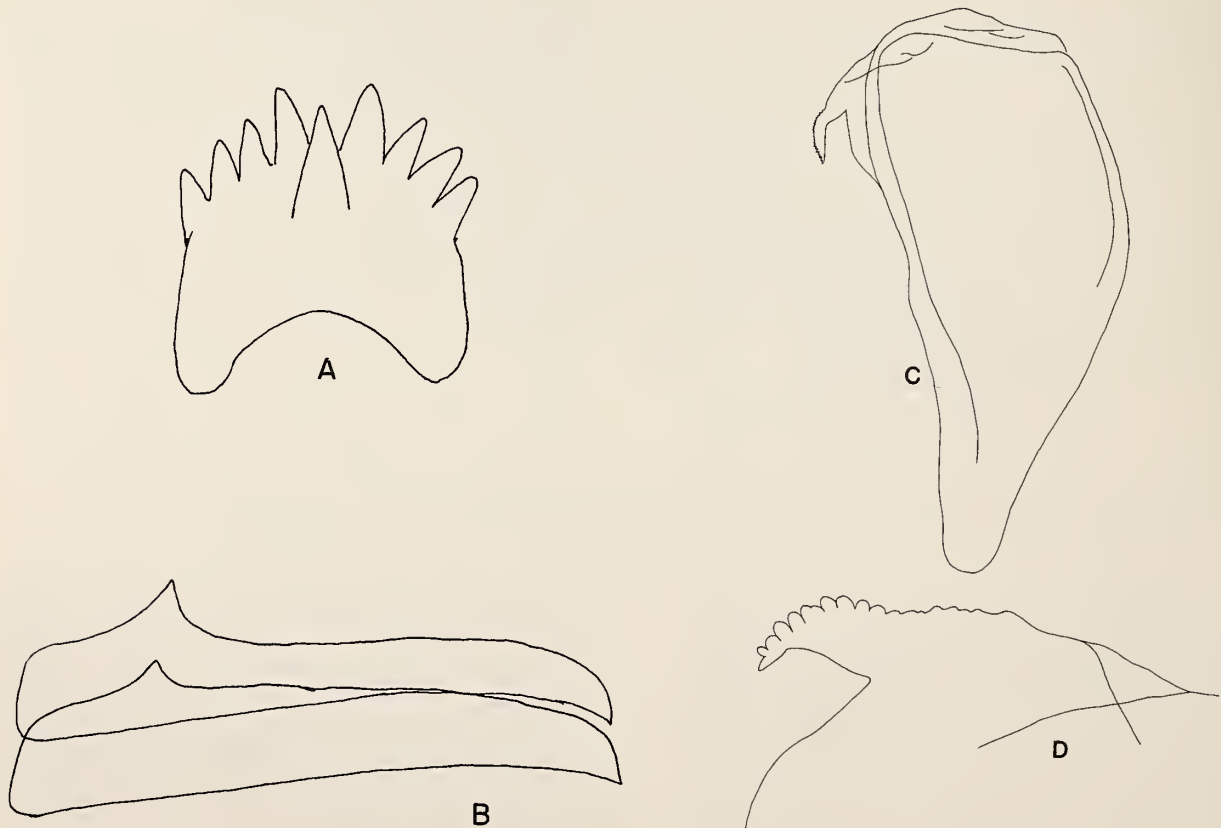


Figure 8

*Eubranchus steinbecki*. A. Rachidian tooth. B. Lateral tooth. C. Jaw. D. Masticatory border of the jaw.

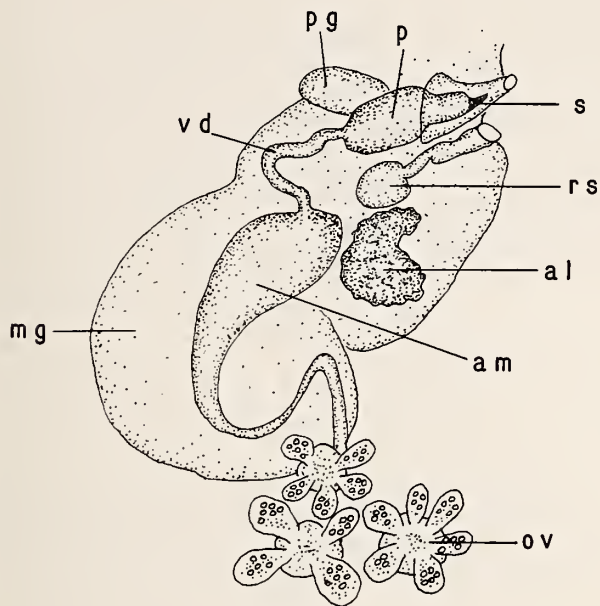


Figure 9

*Eubranchus steinbecki*. Reproductive system. al, albumen gland; am, ampulla; mg, mucus gland; ov, ovotestis; p, penis; pg, penial gland; rs, receptaculum seminis; s, stylet; vd, vas deferens.

1969), the man who not only influenced the works of Edward "Doc" Ricketts, but was himself so greatly influenced by Doc that some have speculated that Steinbeck may have joined the ranks of our colleagues had it not been for Ricketts untimely death. Together they wrote *The Sea of Cortez* and were nearing completion of *The Outer Shores* (see HEDGPETH, 1978a, b).

#### ACKNOWLEDGMENTS

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